EFFECT OF SHOPPING CENTERS ON THE VALUES OF SURROUNDING RESIDENTIAL PROPERTIES

BY

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TABLES OF CONTENTS

page

ACKNOWLEDGMENTS....................................ii

ABSTRACT...v

CHAPTERS

1 INTRODUCTION.....................................1
1.1 Issues and Objectives of the Study..........1
1.1.1 Issues of the study........................1
1.1.2 Objectives of the Study....................4
1.1.3 Shopping Centers--An Introduction..........5
1.2 Definition of a Shopping Center.............5
Definition of a Shopping Center Complex.....6
1.3 Advantages and Disadvantages to Households of Being in Proximity to a Shopping Center......................6

2 LITERATURE REVIEW................................9

3 DEVELOPMENT OF HYPOTHESIS.......................20

3.1 Signs of the Explanatory Variables..............................22
3.2 Functional Form Selection or Model Design..........................24
3.3 Social Implications.........................24

4 RESEARCH METHODOLOGY............................26
4.1 Selection of Neighborhood..................26
4.2 Sources of Data............................30
4.3 Selection of Critical Distance from a Shopping Center for this Study....................................31

5 MODELS OF VARIOUS SHOPPING CENTERS..............34
5.1 Analysis of Ridgeway Shopping Center Complex....................................39

5.2 Analysis of Millhopper Shopping Center Complex.................................42
5.3 Analysis of Hancock Shopping Center........46

6 CONCLUSIONS.......................................81

REFERENCES..87

APPENDIX..91

BIOGRAPHIC SKETCH

Abstract of Dissertation Presented to the Graduate School of
the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy

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Urban planners, city officials, appraisers, and households are concerned about the effect of nonresidential land use developments on residential property values. Their concern is over the potential effects of negative externalities such as traffic congestion, noise, lighting, and pollution on the values of surrounding residential properties. Indeed, the potential for negative externalities has often been cited in public hearings and municipal planning departments as a primary reason for the establishment of zoning districts. The objective of the public policy is to minimize the negative impact of these developments on the values of surrounding residential properties. Such public debates are frequently fueled more by emotion and misinformation than by statistical evidence. This study provides statistical evidence about the effects of shopping centers of varying sizes on the values of surrounding residential properties.

Three cases of shopping centers have been studied and analyzed. A common model is found for these centers, and the variables which significantly affect the values of properties are identified. The radial distance from larger shopping centers was found to affect significantly the values. In both cases of shopping center complexes studied, the values of surrounding residential properties increased up to a distance of about 6,000 feet. The price-radial distance relationship from each complex was found to be concave in shape.

The findings show that present buffer areas between commercial developments and residential properties are not large enough to minimize the impact on the values of residential properties. If the objective of public decision makers is to minimize the impact of larger shopping centers, local officials should delineate sufficiently large zoning areas for such nonresidential land uses.

For appraisers, this dissertation identifies the significant variables affecting values of residential properties near shopping centers.

The implication for the households is that less expensive housing is located closer to larger shopping centers than the more costly residences.

CHAPTER 1
INTRODUCTION

1.1 Issues and Objectives of the Study

1.1.1 Issues of the Study

This dissertation addresses the effect of existing shopping centers of different sizes on the values of surrounding residential properties.[1] It examines whether these externalities affect house prices, and if so, the amount of the price changes as one moves away from such centers. Little research appeared in the real estate and urban economics literature on the possibility of positive price gradients from such sources that simultaneously produce both positive and negative externalities.[2]

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[1] The definition of a shopping center is given on page 5.

[2] A house price gradient from a particular location is defined as the rate of change of selling price with respect to a small change in distance from that location. In other words, it is the marginal change in the price with the marginal change in the distance from the location. A positive price gradient means that the change in the selling price with respect to a small change in distance is positive.

A further issue explored is the difference in the impact on the values of surrounding properties by an existing shopping center compared to that of an existing shopping center complex and the distance of the impact.[3]

A previous study on the effect of a shopping center on the values of surrounding properties was done by Colwell, Gujral, and Coley (1985). This research was an event study which attempted to determine the effects of the announcement of construction of a shopping center on the values of nearby residential properties. They found that there occurred a positive house price gradient after the announcement. Richardson (1977a) suggested theoretically that a positive urban house price gradient was feasible as a result of an externality, and that such a gradient was consistent with locational equilibrium.[4] Colwell and Foley (1979) found a positive house price gradient from a negative externality, a high voltage electrical transmission line.

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[3] The definition of a shopping center complex is given on page 6.

[4] There are two types of externalities--positive and negative. Positive externalities, sometimes referred to as indirect benefits, arise from the action of producers or consumers without incurring the costs of the action that created the externality. On the other hand, negative externalities, sometimes referred to as indirect costs, arise from the actions of producers or consumers who do not pay the full costs of their activities. These costs are imposed on members of society who do not benefit from the action creating the externality.

Kain and Quigley (1970b) analyzed two cases--one for rented houses and the other for owned houses. They found that nonresidential land use, such as a commercial or industrial property, had a significant impact on both the rented and the owner-occupied houses. Thibodeau (1990) estimated the effect of a high-rise office building on residential property values. The empirical results indicated that the residential property values for nearby houses were lower than the values of houses farther away. However, values for properties located between 1,000 meters and 2,500 meters away benefitted from the high rise. In another study, Grether and Mieszkowski (1980) found that nonresidential use, such as commercial or industrial, had no systematic effect on house values.

Further, knowledge about the impact of these centers on property values is important not only to households and property owners but also to appraisers, lenders, and local public officials. All of these parties could benefit from knowing whether this effect exists and, if so, up to what distance. These parties would consider this phenomenon while buying, appraising, making a loan for a house, and assessing the effectiveness of local public policies around a shopping center.

This dissertation differs from the previous study by Colwell et al.(1985), as an endeavor is made to find the effects of an existing shopping center or an existing shopping center complex on the values of surrounding properties. Three cases have been studied and analyzed in this dissertation. This dissertation also differs from the previous study, as it uses more observations. The previous study used only one subdivision for analysis. In this study, three cases of shopping centers are analyzed. The three cases differ from each other in their attributes.[5]

Another important manner in which this dissertation differs from previous studies is that the quadratic (square) terms of various structural, locational, and time-trend variables have been tested and found to be significant explanatory variables.[6]

1.1.2 Objectives of the Study

The objectives of this study are derived from the above-mentioned issues. These are

(1) To find the distance over which the effect of an existing shopping center or shopping center complex influences the values of surrounding residential properties, and the amount of impact.

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[5] The features of each shopping center or complex are given on pages 27 to 30.

[6] However, in this study, the third-order terms of various variables were found not to affect the values of the residential properties.

(2) To find whether house price gradients differ with the size of the center.

1.1.3 Shopping Centers--An Introduction

In this study, three shopping areas in Gainesville, Florida, are studied. The first is a neighborhood shopping center, Hancock Square. The second is a shopping center complex consisting of two neighborhood shopping centers, namely, Ridgeway Plaza and Northwood Plaza. The third is another shopping center complex consisting of five neighborhood shopping centers and a community shopping center. These are Millhopper Shopping Center, Thornebrook Village, Millhopper Square, La Pavilion, an unnamed neighborhood shopping center, and The Market Place respectively.

1.2 Definitions of a Shopping Center and a Shopping Center Complex

The term 'Shopping Center' is often loosely used. However, its definition and related terms are now standardized. The term shopping center refers to

> A group of architecturally unified commercial establishments built on a site which is planned, developed, owned, and managed as an operating unit related in its location, size, and type of shops to the trade area that the unit serves. The unit provides on-site parking in definite relationship to the types and total size of the stores. (see 1990 Directory of Shopping Centers in the U.S by The National Research Bureau, Glossary, Section 1)

Shopping Center Complex

This is a term defined for this study only. It is a group of two or more shopping centers developed within walking distance of each other. They may adjoin each other or face each other and be separated by a road. Two cases studied in this research are shopping center complexes. These are Millhopper Shopping Center Complex and Ridgeway Shopping Center Complex.

1.3 Advantages and Disadvantages to Households of Being in Proximity to a Modern Shopping Center

Many parties benefit from the facilities and conveniences provided by a modern shopping center.

First, the coordinated grouping of retail stores confines the lights, traffic congestion, noise, and environmental pollution to one general area. Nearby residential areas may be isolated from commercial encroachment.

Second, a customer can go at one time to a large shopping center and can buy various types of goods. A single retail shopping center or shopping center complex can save time and gasoline. Many consumers want to shorten their shopping time in order to have more time for entertainment, leisure, and other activities. Thus, a shopping center provides convenience to nearby households.

Third, more infrastructure around a shopping center may serve several retail units congregated at a single site. The increased infrastructure may include better street planning, maintenance, traffic control, police, and fire protection. The nearby households may benefit more from it than the households located at a greater distance from the center.

Fourth, in times of expensive urban parking, the free parking provided by shopping centers may be appealing to the consumers and nearby households. Thus, being close to a shopping center may increase the likelihood that nearby land values will be higher than they would be otherwise. Moreover, there is a possibility of changes in zoning from residential to commercial over time as commercial activities expand in that area, and this can increase the land values.

Last, the trips to a shopping center are treated by some consumers as part of their entertainment and manner of enjoyment of leisure time. The fashion shows, mall exhibits, new car shows, and presentation of entertainment and sports celebrities tend to appeal to the entertainment needs of potential shoppers. Nearby household residents can benefit from the entertainment possibilities provided by a shopping center. Thus, there are certain advantages to the households of being in proximity to a shopping center (see Hines, 1988).

In contrast, there are certain disadvantages to households of being in proximity to a shopping center. These may include increased traffic volume and congestion. This, in turn, may cause more time cost in travel on those roads, an increased level of noise, and air pollution. Finally, unwanted lighting, at night, is another type of disamenity.

The earlier mentioned advantages and disadvantages to nearby households may vary from center to center depending on the size, topographical features, location, age, types of goods provided, and the distance of a house from the center. This dissertation is concerned with the effect of these positive and negative externalities produced by shopping centers on values of surrounding residential properties.

CHAPTER 2
LITERATURE REVIEW

There is an abundant literature on the effect of externalities on the values of residential properties but a limited literature on the effects of shopping centers. An earlier event study of a shopping center was done by Colwell, Gujral and Coley in 1985. They estimated the effect of an announcement of construction of a neighborhood shopping center on the values of surrounding properties. They found that the announcement had both positive and negative effects on the values of surrounding residential properties. Before announcement, the nearby residential value gradient sloped downward from the site, but after announcement, the nearby residential value gradient sloped upward.[1] This implied that after announcement, values of properties fell within 1,500 feet, and beyond that, values of properties rose above their prior values. That study provided evidence that there is apprehension on the part of residential property owners that the location of commercial activity in the immediate neighborhood might adversely affect the values of their properties.

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[1] The authors did not explain the reason for existence of the downward slope before the announcement of construction was made.

Kain and Quigley (1970b) showed that proximity to a 'nonresidential use' (a commercial or industrial property) can have a negative impact on apartment rents and on the values of single family homes. The measure of residential quality associated with individual dwelling units was obtained by factor analysis using 39 indices of quality of the dwelling units, structures, parcels, and micro-neighborhoods. Five factors representing quality were used. These were (1) basic residential quality, (2) dwelling unit quality, (3) quality of proximate properties, (4) quality of nonresidential properties in the neighborhood (commercial and industrial land uses), and (5) average structure quality.

Using the data of approximately 1500 households and dwelling units in the city of St. Louis, they tested separate models for owner-occupied and rented properties. They regressed selling price of owner-occupied homes over five quality factors, along with other quantitative variables. The latter included lot-size, living area, number of bedrooms, number of bathrooms, quality of nearby schools, age, and racial composition.

They found that the factor 'nonresidential use' was significant at the 95% level of confidence in the renter model and at the 90% level in the owner-occupied model. This factor was found to be more significant within the city of St. Louis than in the county. The other variables which were found significant for owner-occupied properties were lot size, floor area, age, quality of the nearby school, and racial composition. For rented properties, the significant variables were duration of occupancy, occupancy of the building by the owner, school quality, and racial composition. The variable 'distance to central business district' was found insignificant in both cases.

A study by Colwell and Foley (1979) revealed negative effects of an externality on the values of surrounding properties. They took a sample of 200 sales of properties lying in proximity to a very high voltage electric transmission line in Holiday Hills and Windsor Village, Illinois. They found that the coefficient of the variable proximity to electric transmission line was significantly negative. The estimated model indicated that selling price tended to increase at a decreasing rate as the distance from the transmission line increased. Although the transmission line had little impact beyond 200 feet, large differences in selling price existed between 50 and 200 feet from the transmission line.

Grether and Mieszkowski (1980) studied the effect of nonresidential land use on the values of single-family homes in New Haven, Connecticut, and surrounding suburban communities during the period 1955-1970. They found that nonresidential land use per se had no systematic effect on house values. Low-density apartment developments and minor commercial centers were relatively harmless. However, heavy industrial activity and public housing projects had adverse effects on the prices of nearby residential properties. They found that distance to minor commercial centers had no effect.

Thibodeau (1990) estimated the effect of a high-rise office building on residential property values. He employed the hedonic estimation technique to estimate the effect of a high-rise office building on the values of nearby houses in a small residential area of North Dallas. The empirical results indicated that Lenox Center introduced both positive and negative externalities to the neighborhood. Residential property values for nearby houses within 1,000 meters were discounted by as much as 15%. Alternatively, values for properties 1,000 meters away from the high-rise sold for a 5% premium. The price-distance relationship was concave.

Richardson (1977a) showed that a positive rent gradient or house value gradient was quite plausible when environmental influences were taken into account. Polinsky and Shavell (1973) showed that the introduction of public goods results in irregular rent gradients. Ellis (1967) emphasized the importance of environmental preferences and neighborhood characteristics in location decisions of households. These preferences create a differential in demand for the houses in those areas and affect their prices.

Kitchen and Hendon (1967) first tested and confirmed the hypothesis that positive impacts were generated by nearby parks. Weicher and Zerbst (1973) found that only the properties facing the open space obtained a positive effect on their values. Richardson (1977b) and Diamond (1980) found that public services, tax rates, air quality, quality of schools, average density of the neighborhood, and the possibility of long-run appreciation affect significantly urban house prices. Jud and Watts (1981) included school quality and racial composition in their model of housing prices. They found that local public schools had a significant effect on nearby house values. They also found that the racial composition of public schools generally had an impact on the values of nearby properties.

Ridker and Henning (1967) found a detrimental effect of air pollution on the values of surrounding properties. Other studies on this issue were done by Freeman (1971, 1974a, 1974b, and 1979) and Anderson and Crocker (1971, 1972). Walters (1975) and Mieszkowski and Saper

(1978) studied the impact of noise on the values of properties. They found that the houses located in noisier places sold at a discount.

Most of the above studies show that impact of location on urban house prices is a function of important linkages. The above studies also indicate that the externalities can be positive or negative. In these cases, both positive and negative externalities are present.

Regarding the effect of various physical, locational, and financing variables on the values of residential properties, a vast amount of hedonic modelling has been done. Hedonic modelling assumes that housing is a commodity that is not viewed as a homogeneous good but as a combination of many separate and diverse physical and locational items (for example, living area, lotsize, bedrooms, etc.). It is rare to observe distinct markets for these items (King, 1973).

The best way to estimate the value of a good with diverse components is to find the implicit price rendered by these items to its total selling price. Observed product prices and the specific amounts of characteristics associated with each good define a set of implicit or hedonic prices. The relationship between observed prices and observed characteristics becomes evident when price differences among goods are recognized as equalizing differences for the alternative packages embodied by them. Rosen (1974) defends the research technique of regressing value on hedonic characteristics by noting:

> Hedonic prices are defined as the implicit prices of attributes and are revealed to economic agents from observed prices of differentiated products and the specific amounts of characteristics associated with them. Econometrically, implicit prices are estimated by the first-step regression analysis; that is product price is regressed on the characteristics in the construction of hedonic price indices (Rosen, 1974, pp. 34-35).

Johnson and Phillips (1984) used hedonic modelling to show that individual housing units demonstrated differential capital gains. This was due to the varying mix of attributes associated with those housing units. The purpose of their study was to identify the mix of attributes which significantly affect capital gains in a particular housing market. Their conclusion was that living space, number of bedrooms, number of bathrooms, quality, house condition, number of fire places, property tax rate, and accessibility to work-place significantly affect capital gains. They put special emphasis on living space. Quality of fire protection and crime activity were found insignificant. They also suggested that presence of a negative sign with bedrooms in the regression results, while holding living space constant, could indicate poor design of the house.

Bajic (1985) empirically estimated demand equations for housing attributes, using a two-step approach in conformity with the procedure proposed by Sherwin Rosen.

In the first step, the estimates of nonlinear hedonic price equations were used to obtain implicit (marginal) prices of individual attributes. These implicit prices were then used to estimate the demand functions of individual attributes in the second step.

The structural variables of a house used in the above studies are lot area, total floor area, living space, number of bedrooms, number of bathrooms, age, garage/carport, basement, quality of construction, exterior, and interior wall condition.

In this study, a time trend variable is also included to capture the effect of the changes in values of a property over time. The number of months since sale from the date of last sale until date of this study (NMS) can be used to reflect the time trend. The price level is assumed to be increasing over time due to inflation. A quadratic term for the time-trend variable (NMSSQ) has been incorporated in the models. This variable accounts for nonlinear increases in price due to inflation over time. This variable would be a reasonable approximation to smooth the nonlinear increases of the house prices over time and is incorporated to test its significance. The variable (NMS) was used in the studies by Colwell and Foley (1979) and Colwell, Gujral, and Coley (1985).[2] The date of this study for finding the time trend variable is June, 1990.[3]

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[2] The value of a property is also affected by the financing conditions. With the availability of below-market financing through an assumable mortgage, the value of a property might be more than that of a comparable property with normal market financing. The below-market financing causes some savings to the buyer. The seller may increase the selling price by some proportion of the savings depending upon the market conditions. Smith and Corgel (1984) suggested a method for adjusting for nonmarket financing. In that method, they suggested capitalization of savings for five years as a reasonable approximation of total savings effect. For this study, the underlying mortgages of the various properties were studied by checking the official records in the Alachua County Public Records Office in Gainesville, Florida. However, no property in the selected sample had below-market financing at the time of sale. So, the financing variable is not included in the study

[3] The variable 'racial composition in the neighborhood' is not included in the study, as the area under study has a mostly white population. All the shopping centers are located in census zip codes 32605 and 32606. The racial composition in these zip codes is shown in Table 17 on page 80.

CHAPTER 3
DEVELOPMENT OF HYPOTHESES

It is hypothesized that the values of properties should be higher near a neighborhood shopping center and should fall as the radial distance from the center increases. This is because the amenities should outweigh the disamenities produced by it. However, after a certain distance from the center, negative externalities may vanish and positive externalities may remain. Thus, the house price gradient should slope downward monotonically.[1] That is, the price-distance curve for a neighborhood shopping center should be sloping downward and is hypothesized to be of convex shape.[2]

---

[1] Monotonic means unidirectional. Monotonically decreasing means that at no instant is there any increase in the values.

[2] If you join two points on the surface of a convex function by a chord, the function itself lies underneath the chord on the interval joining these points. On the other hand, a concave function lies above the chord on any interval. A function is convex if and only if its slope or first-derivative is nondecreasing with the variable. A function is concave if and only if its slope is nonincreasing with the variable. The diagrams of concave and convex functions are shown on the next pages.

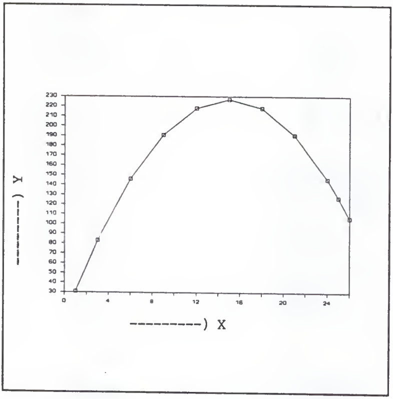

Figure 1. CONCAVE FUNCTION

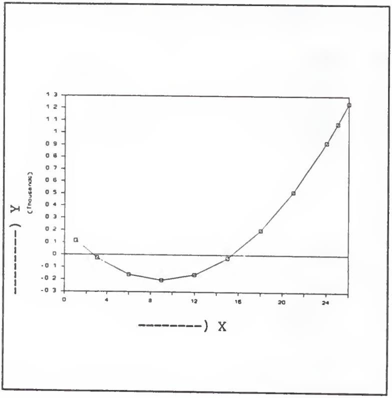

Figure 2. CONVEX FUNCTION

In contrast, a shopping center complex has a higher GLA (Gross Leasable Area), more parking spaces, and a larger number of stores. These characteristics can cause more traffic volume, traffic congestion, auto pollution, and noise. Thus, the negative externalities are hypothesized to be more pronounced near the complexes than near a neighborhood shopping center. The positive externalities are also hypothesized to be somewhat more pronounced near a shopping center complex than near a neighborhood shopping center. This is due to the increased availability of goods and the possibility of better comparison shopping in the former than in the latter.

Thus, in the case of a shopping center complex, the values of the properties should be lower near it due to more diseconomies than economies produced by it. House values should rise as the radial distance from the complex increases and should fall after a certain distance when only positive externalities may remain, and negative externalities may vanish.

As mentioned earlier, in the absence of negative externalities and the presence of positive externalities, the house price gradient should slope downward. Thus, in short, the price-distance curve for a shopping center complex is hypothesized to be of concave shape.[3].

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[3] The total size of a shopping center seems to be an important factor in pulling customers from the surrounding areas. It is assumed that the larger

3.1. Signs of the Explanatory Variables

Various hypotheses are developed regarding the signs of the explanatory variables. These are

(1) The coefficient of distance of a house from a neighborhood shopping center, whether measured radially or by road, is hypothesized to be negative. On the other hand, in the case of a shopping center complex, this coefficient is hypothesized to be positive.

(2) The coefficient of road distance of a house from a nearby elementary school is hypothesized to be negative. That is, as the distance increases, the values of properties should decrease. This is due to the possible willingness of households with children to pay more for the convenience of being nearer to an elementary school.

(3) The sign of the coefficient of the road distance of a house from a nearby high school is hypothesized to be the same as from an elementary school.

(4) The coefficient of the road distance of a house from the CBD (central business district) is hypothesized to be negative, as given in standard texts on urban economics.[4] Similarly, the coefficient of the road distance

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the number of customers traveling to a shopping center, the larger would be the negative externalities around it. The probability that a customer would travel to a shopping center is a function of the utility provided by a center. Reilley's classical model of retail gravitation includes a broader concept of consumer behavior.

[4] This is the result of monocentric model.

of a house from the University is hypothesized to be negative as University is another major employment place similar to CBD. However, as employment places in Gainesville are scattered, and the road distance of a house from the University and CBD are highly correlated, a new variable which is highly correlated to the above-mentioned two road distances is incorporated in this study and substitutes for these distances. This variable is the road distance of a house from the intersection of NW 13th Street and NW 16th Avenue. The coefficient of this variable is hypothesized to be negative. The intersection is the point through which many households in the northwest sector of the city must travel to go to various places of employment scattered in the northeast, southeast, and southwest parts of Gainesville.

(5) The coefficient of each of the structural variables of a house; living area, lot-size, number of bedrooms, and number of bathrooms is hypothesized to be positive. As the quantity of each of these variables increases, the price should increase in some proportion.

(6) The coefficient of the age of a house is hypothesized to be negative. That is, as the age increases, the price of the property should fall.

(7) The coefficient of number of months from the date of sale until the date of study is hypothesized to be positive. That is, the higher the number of months since

sale, the higher the value of the property due to inflation.

(8) The coefficient of locational variable such as whether a property is on a lake front is hypothesized to be positive.

3.2 Functional Form Selection or Model Design

The basic model hypothesized for this study is

SP= f(LA, Lotsz, Sres, Age, AFCP, AFGR, AFSP,
AFEP, AFOP, BB, BR, Extw1, Extw2, Qlty,
NMS, D1, D2, D3, D4, D5, D6, D7, D8, PLAK)

The list of variables is shown in the appendix.

These above-mentioned variables are included to provide the structural, locational, and time-trend measures of each house which affect its value. The radial distance of a house from a nearby shopping center is included to capture the effects of noise and lighting from the shopping center. The road distance of a house from the shopping center and other road distances have the purpose of capturing the relative accessibility and locational characteristics of the house.

Various forms of models such as linear, mixed, log-linear, semi-log, semi-inverse, and inverse are tested using the above-mentioned variables.

3.3 Social Implications

If the slope of house prices is positive from a shopping center, then some households who want to spend a smaller amount on housing, want the advantages of being close to a shopping center, and are indifferent to the negative externalities produced by it, would prefer to live near it. On the other hand, if the slope of house prices is negative from a center, the positive externalities and utilities provided by it may be more valued by the households. The wealthier and comfort-loving households would prefer to live close to it. Thus, in any case, shopping centers may provide social benefits to the nearby property owners. Some households may prefer to live near a shopping center if their preference is for convenience or savings.

CHAPTER 4
RESEARCH METHODOLOGY

4.1 Selection of Neighborhood

The shopping centers for this study are located in the NW part of Gainesville, Florida.[1] Gainesville has over 35 shopping centers scattered throughout the urban area. Gainesville can be divided into four quadrants by the intersection of two major streets, University Avenue and Main Street.[2]

The west part and especially the NW quadrant are basically homogeneous residential areas. This quadrant does not have any public housing projects or industrial area. There are some office buildings near the Millhopper shopping center complex. Thus, for this study, the shopping centers lying in the NW quadrant and on the outskirts of the city are selected. Another criterion used for selecting a shopping center is that there should not have been any construction activity, such as expansion and/or renovation, for the last few years. The values of properties around the shopping center selected should not reflect these types of activities.

---

[1] About 6.4 percent of the civilian force of Gainesville is in manufacturing industries and 42.4 percent is in state or federal government, including University of Florida employees. There is a little industry on the NE and SE part of Gainesville. The university is another major employment place besides the Central Business District. There are 33 schools--20 elementary, 7 middle, and 6 high--that serve over 22,000 students.

[2] The east part of Gainesville is avoided for study, as there is some light manufacturing/non-manufacturing industry in that part. Also, there are a few public housing projects in the NE and SE parts of Gainesville.

Using the above criteria for the selection of shopping centers, three shopping centers were selected in the NW quadrant of the city. One is a neighborhood shopping center, and two are shopping centers complexes. The characteristics of these shopping centers are as follows:

(1) Hancock Square is a neighborhood shopping center and is located at the intersection of NW 39th Avenue and NW 22nd Drive. Its gross leasable area (GLA) including anchors is 47,500 square feet. It has 6 stores and about 100 parking spaces. There has been no construction/renovation activity since 1985.[3]

(2) A shopping center complex which consists of two neighborhood shopping centers. These are Northwood Plaza and Ridgeway Village. This complex is located at the intersection of NW 31st Terrace and 34th Street. The complex

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[3] Shopping Center Directory, The South 1989 contains the necessary information about all the shopping centers in the south of the U.S.

has a total gross leasable area (GLA) of 48,500 square feet. It has 22 stores and 150 parking spaces.[4]

Northwood Plaza was first opened in 1979. It has one level and is on one acre area of land. It has 6 stores and 35 parking spaces, and does not have any food court. The last renovation date was 1985/1986. The gross leasable area (GLA) including anchors is 8,500 square feet. The average lease rate is $9-10/square foot[5].

Ridgeway village was first opened in 1980. It has a gross leasable area (GLA) including anchors of 40,000 square feet and has 16 stores. There has not been any construction activity since 1985. The distance between the outer boundaries of Northwood Plaza and Ridgeway Village is less than 300 feet.

(3) Another shopping center complex consists of Millhopper Shopping Center, Millhopper Square, The Market Place, Thornebrook Village, La Pavilion and an unnamed shopping center. The unnamed shopping center lies across NW 43rd street from the Market Place. The other shopping centers adjoin each other.

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[4] The various road distances for this study were calculated by using Rand McNally Map Service Company's Champion Map of Gainesville, Florida.

[5] See Shopping Center Directory, The South, 1989

Millhopper Shopping Center was opened in 1973. Its gross leasable area (GLA) including anchors is 80,305 square feet. It has 14 stores and 400 parking spaces. There has not been any construction activity since 1985.

Millhopper Square is a neighborhood shopping center first opened in 1974. Its gross leasable area (GLA) including anchors is 16,749 square feet. It has 15 stores, 97 parking spaces, and one level. The last date of renovation was 1982. The average lease rate is $13-15/square foot.

The Market Place is a community shopping center, while all of the others are neighborhood shopping centers. It was first opened in 1982 and has a traditional-mix market strategy. It has 76,025 square feet of gross leasable area (GLA) which includes space for anchors. It has 9 acres, 1 level, 18 stores, and 423 parking spaces. There has not been any construction activity since 1985.

Thornebrook Village is a neighborhood shopping center that opened in 1984. Its gross leasable area (GLA) including anchors is 77,112 square feet. It has one level, 44 stores, and 358 parking spaces. It has a food court. The last expansion activity was in 1985.

La Pavilion is a neighborhood shopping center and has a gross leasable area GLA of 23,000 square feet. It has 6 stores and 100 parking spaces. The unnamed shopping center has a GLA of 21,000 square feet, 7 stores, and 50 parking spaces.

These six centers are considered to be a shopping center complex for this study. As can be noted from above, none of the above shopping centers had any major construction/renovation activity since 1986. This complex has 294,191 square feet of total gross leasable area. It has 104 stores and 1430 parking spaces. This complex is located at the intersection of NW 23rd Avenue and NW 43rd Street.

4.2 Sources Of Data

The data were collected from various sources.[6] Data on properties around shopping centers were obtained from the Alachua County Property Appraiser's Office. The time period covered by the data is four years back from the date of study, which is June, 1990. The data regarding structural and time trend variables of houses were collected from the MAF (microfiche) cards and sales maps of the Alachua County Property Appraiser's Office in Gainesville.

Data regarding financing variable were collected from the official records (O.R) books of the County Public Records Office. The data regarding the locational variables of houses, such as various types of distances used in the study, were calculated using the Champion Map Of Gainesville, Florida--Rand McNally Map Service Company.

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[6] Sourcebook of Demographics & Buying Power for Every Zip Code in The USA, Arlington, VA: C.A.C.I, 1987

Similarly, data regarding other variables including school quality, public housing, and race were collected from personal interviews with officials of the School Board and published materials.[7]

4.3 Selection of Critical Distance From a Shopping Center For This Study

As mentioned earlier, in a previous study done by Colwell and others, it was found that after the announcement of construction of a shopping center, the values of surrounding properties declined within 1,500 feet. Beyond 1,500 feet, values of properties rose above their prior prices. To determine the full effect of a shopping center on the values of surrounding properties, all the residential properties having transaction prices recorded, and which were lying within a circular area of a given radius, with center of the shopping center as the center of the circle, were observed and used. This radius is called the critical distance in this study. For each of the shopping center complexes, the critical distance chosen for the study is

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[7] This dissertation differs from the previous study by Colwell et al. (1985) as it uses more observations, 106, 126, and 84 on single-family homes and considers 7, 14, and 7 subdivisions for Ridgeway Shopping Center Complex, Millhopper Shopping Center Complex, and Hancock Shopping Center respectively.

6,000 feet. For the neighborhood shopping center, it is 3,000 feet (see Figure 3). These distances were considered to be sufficient to show the effect of shopping centers or shopping center complexes on the residential values.[8]

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[8] As shown in the Figure 3, the closest distance between the two shopping center complexes is 9,000 feet. The closest distance between Ridgeway Complex and Hancock Square is also 9,000 feet.

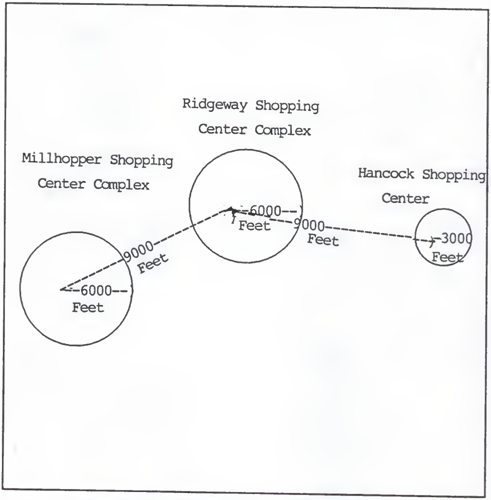

Figure 3. RADIAL DISTANCES BETWEEN VARIOUS SHOPPING CENTERS

CHAPTER 5
MODELS OF VARIOUS SHOPPING CENTERS

Various models of each shopping center or complex are estimated in this research. All highly correlated variables were excluded from the complete model of each case of shopping center.[1] As can be seen from Table 2, in the complete model of Ridgeway shopping center complex, there is a multi-collinearity problem as the variables in this model are biased. In order to avoid this problem of multi-collinearity, a reduced model was found using stepwise regression, forward selection, backward elimination procedures, and knowledge from literature review related to this field of study.[2] The important feature of this model is that in the linear, semi-log, and log forms, R^2 and F values are approximately equal. This shows the robustness of the model.

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[1] The number of bath rooms, number of bed rooms, and quality were highly correlated to living area in case of each shopping center studied. Therefore, these variables were excluded from the common model. For the same reasons, the variables finished garage, and finished car-port were also excluded, as these were highly correlated to living area. The road distance (D2) was highly correlated to radial distance (D1) and thus, was excluded. Similarly, the road distance to high school (D5) was highly correlated to road distance from the nearby elementary school (D4) and was excluded. Also, the road distance from the University (D6) and road distance from Central Business District (D7) were excluded, as these were highly correlated to (D8) which is the road distance from the intersection of 13th street and NW 16th avenue.

Similarly, for Millhopper shopping center complex, and Hancock shopping center, there is a multicollinearity problem in the complete models. This can be seen from Table 7 and Table 12 respectively. The variables in these models are biased. In these cases, the final model is also found using the same criteria as described in the case of Ridgeway shopping center complex.

To account for statistical interaction among independent variables, various interaction terms were included, as can be seen in the complete model of each case. However, none of the interaction terms was found sufficiently significant to be included in the reduced model of each case.

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[2] For example, the variables living area, lot-size, number of stories, and age were found significant in previous studies by Johnson and Phillips (1984), and Bajic (1985). Similarly, number of months sold were found significant in studies by Colwell and Foley (1979) & Colwell, Gujral, and Coley (1985). The nearness to park, elementary school, and distance from central business district (CBD) were found significant by Kitchen and Hendon (1967), Hendon (1971, 1973, 1974), Walters (1975), & Mieszkowski and Saper (1978).

A common reduced model allows for comparing the effects of various centers on the values of surrounding residential properties. This model fits quite well in each case. In one case (Ridgeway shopping center complex), the linear form has higher R^2 and F values than of other forms. However, in the other two cases (Millhopper shopping center complex and Hancock shopping center), the log form has higher R^2 and F values. Between the semi-log and the log form, the log form is found to be superior in each case due to higher R^2 and F values. This comparison can be made as the dependent variable is the same in both these forms. However, no direct comparison can be made between the linear and the log form.

Using Box-Cox transformation, it was found that the maximum log likelihood value for linear form was approximately the same as for the log form in the case of Ridgeway shopping center. For $\lambda = 0$ (Log form), the value of the maximum likelihood function is found to be -888, whereas for $\lambda =1$ (Linear form), the value of the maximum likelihood function is found to be -889. Thus, the log form seems to be slightly superior to the linear form. However, as R^2 and F values are approximately the same in all forms, this further suggests the robustness of the model. The results are interpreted from the linear model due to ease of interpretation and calculation of house price rise at various distances from the complex. In the log model, calculation of house price rise is quite difficult. The linear model is a very close approximation of the log model.

Similarly, in the case of Millhopper shopping center complex, it was found that the maximum log likelihood value for linear form was approximately the same as for the log form using Box-Cox transformation,. For $\lambda = 0$ (Log form), the value of the maximum likelihood function is found to be -1205 whereas for $\lambda = 1$ (Linear form), the value of the maximum likelihood function is found to be -1260. However, as stated earlier, the linear form is used for analysis purposes due to ease of interpretation and calculation of house price rise at various distances from this complex.

However, in the Hancock shopping center case, the linear form is found to be superior to the log form. The semi-log form is inferior to the log form as can be seen from R^2 and F values of the models. The reason for using this comparison is stated earlier. Using Box-Cox transformation, it was found that the maximum log likelihood value for linear form was approximately the same as for the log form. For $\lambda = 0$ (Log form), the value of the maximum likelihood function is found to be -730 whereas for $\lambda = 1$ (Linear form), the value of the maximum likelihood function is found to be -725.

Thus, in two of the three shopping centers studied, the log form was found to be superior to the linear form. The results are interpreted and analyzed using the linear model in each case for the reasons mentioned above.

Moreover, the residuals when plotted against predicted selling prices were approximately normally distributed in each form with no trend, time effect, or autocorrelation (or cyclical pattern). Thus, there was no hetroskedasticity problem in the models.[3] The patterns of residuals satisfied the assumptions for using inference procedures of the multiple regression models.[4] That is, if the observations are in fact normally distributed about the unknown population regression equation with constant conditional standard deviation, then the residuals should be approximately normally distributed. The one-tail test is used to determine the significance of coefficients including their signs. This model fits quite well in each case. The tables of summary statistics, complete model, and the linear, semi-log, and log forms of the reduced model of each shopping center are shown at the end of this chapter.

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[3] However, models with 1/SP, square root of SP as dependent variable were tested. The results of these forms were found not superior to those of linear or semi-log or log form.

[4] The basic assumptions are
(i) The true regression function has the form used in the model.
(ii) The conditional distribution of dependent variable is normal.
(iii) The conditional distribution of the dependent variable has constant standard deviation throughout the range of values of the independent variables. (A condition referred to as homoscedasticity)
(iv) The observations on the dependent variable are statistically independent as would occur in random sampling.

For the Ridgeway shopping center complex, adjusted R^2 values in the linear, semi-log, and log form are 0.8068, 0.7924, and 0.7963 respectively. This means that the linear, semi-log, and log form measure 80.7%, 79%, and 79.6% respectively of the total variation in selling price that is explained by the simultaneous predictive power of all independent variables used in these forms. These high percentages show that the models in these forms fit the data quite well. F values in each of these forms are significant as probability > F is 0.0001. These values simply confirm the overall utility of these model forms.[5] In the following pages is described the analysis of Ridgeway shopping center complex.

5.1 Analysis of Ridgeway Shopping Center Complex

This complex is located in a residential area where the mean selling price of houses is $ 59,204.10. The mean values of living area, lot size, number of stories, age, bedrooms, bathrooms, and number of months sold are 1,340 square feet, 10,495 square feet, 1, 13 years, 3, 2, and 27 respectively. The standard deviations of these variables are 217 square feet, 3,526 square feet, 0.28, 4.7 years, 0.31, 0.29, and 11.6 respectively. The mean values of radial distance, road distance from the nearby park, road distance from nearby elementary school, and road distance from nearby point of intersection on two streets are 3,252, 5,359, 10,142, and 24,854 feet respectively. The standard deviations of these variables are 1,148, 1,728, 2,813, and 6,209 feet respectively.

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[5] F statistic determines whether the data provide sufficient evidence to indicate that the model contributes information for the prediction of dependent variable.

Among the locational variables affecting house values, radial distance from the complex (D1) is found to affect significantly the values of nearby properties. The variable is significant at the 95% confidence level, using the one-tail test. The variable D1SQ is also significant at the 95% confidence level using the one-tail test, which implies that the sign of the coefficient of D1SQ can be concluded to be negative. This further means that the price-distance curve is concave.[6] That is, the values of nearby properties rise as the distance from the shopping center complex increases to some point. Then, these fall after that distance. The maximum distance from this complex to the point where the values of properties increase is approximately 4,892 feet. The price rise per foot at various radial distances from the shopping center complex is shown in Table 16 on page 78. From the table, it is clear that as the radial distance from the complex increases, prices rise but at a decreasing rate. For example, at 1,500 feet from the complex, the price rise per foot is $ 3.77. At 2000 feet, the price rise per foot is $ 3.21.

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[6] The price-radial distance can be written as $SP = Intercept + 5.430245*D1 - 0.000555*D1SQ + \varepsilon$ The second order differentiation would give a negative value. The negative value is a necessary and sufficient condition for concavity and maxima to exist. The maximum value is found by first order differentiation which is $dSP/dD1 = 5.430245 - 0.001110*D1$ and setting it to zero. Solving this gives $D1 = 4892$ feet. It is up to this radial distance from the complex that selling price rises.

Similarly, the road distance from the nearby park (D3) is significant at the 95% confidence level using the one-tail test. This also implies that the sign of D3 is significantly positive. However, the sign of D3SQ is significantly negative at the 90% confidence level. Thus, the price-distance relationship using the road distance from the nearby park is concave. It means that proximity to a park is not preferred by households. This non-preference may be caused by an aversion to traffic and noise generated in and around the park or fear of crime.

Further, the price-distance relationship of a house from the nearby elementary school is a convex function, implying that nearness to an elementary school is highly significant. Both D4 and D4SQ are significant at the 95% level using the one-tail test.

The price-distance relationship using the distance from the point of intersection of two streets is found to be concave. Both D8 and D8SQ are significant at the 95% confidence level using the one-tail test. As mentioned earlier, this point is on the intersection of NW 13th Street and NW 16th avenue. This is the point to which many households around each shopping center travel to go to various employment places scattered in the NE, SE, and SW parts of Gainesville. The reason for concavity of this relationship is that this shopping center complex is located on NW 34th st. Within 6,000 feet of the center is State Highway 232 on one side and 49th Avenue on the other side. Due to higher traffic volume on these side roads, the values of properties are higher near the shopping center complex. The values are lower as we move away from the complex toward these side roads while going to the point of intersection.

Within the 95% confidence level using a one-tail test, the most significant structural variables of a house are found to be its living area, square of living area, and number of stories.

The signs of the coefficients of structural variables correspond well with the expected hypothesized signs. That is, the higher the quantity of each of these variables, the higher the selling price of a house.[7] For example, the higher the number of stories in a house, the greater its selling price. However, the age variable is found to be insignificant.

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[7] A convex relationship is found between lotsize and values of properties. The relationship between SP and lot size can be written as SP= Intercept -

The semi-log model is found equally robust, although it has a lower R^2 value and lower t values of individual variables, especially of D1 and D1SQ. Due to difficulty in the interpretation of the variables in the log model, it is not considered further. The final selection of form for interpretation is already explained in the earlier pages of chapter 5.

5.2 Analysis of Millhopper Shopping Center Complex

The tables of summary statistics, complete model, and the linear, semi-log, and log forms of the common model for Millhopper shopping center complex are listed at the end of this chapter. The criteria for developing the common model and selecting the various variables are already presented on page 34. As mentioned earlier, this is the largest shopping center complex among the three cases studied in this research.

0.422218*Lotsz + 0.00024191*lotszSQ + $\mathscr{E}$. The second order differentiation of SP with respect to lotsize gives a positive value which is a necessary and sufficient condition for existence of minima and thus convexity. The mean lot size in this case is 10,495 square feet. By considering other cases of shopping centers, it is concluded in this study that as lotsize increases, the relationship becomes concave. At lower values of mean lot size in an area, this relationship is convex.

For Millhopper shopping center complex, adjusted R^2 values in the linear, semi-log, and log form are 0.6714, 0.6649, and 0.6800 respectively. This means that the linear, semi-log, and log form measure 67%, 66.5%, and 68% respectively of the total variation in selling price that is explained by the simultaneous predictive power of all independent variables used in these forms. These high percentages show that the models in these forms fit the data quite well. F values in each of these forms are significant as probability > F is 0.0001. These values simply confirm the overall utility of these model forms.[8]

This complex is located in a residential area where the mean selling price of a house is $ 78,196. The mean values of living area, lot size, number of stories, age, bed-rooms, bath rooms, and number of months sold are 1,691 square feet, 13,147 square feet, 1, 11 years, 3, 2, and 30 respectively. The standard deviations of these variables are 493 square feet, 5862 square feet, 0.35, 6.59 years, 0.53, 0.35, and 12.98 respectively. The mean values of radial distance, road distance from the nearby park, road distance from nearby elementary school, and road distance from nearby point of intersection are 4,113, 10,229, 10,101, and 20,046 feet respectively. The standard deviations of these variables are 1,141, 2,172, 3,142, and 3,728 feet respectively.

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[8] F statistic determines whether the data provide sufficient evidence to indicate that the model contributes information for the prediction of dependent variable.

Among the locational variables, the radial distance of a house from the shopping center complex (D1) and square of this radial distance (D1SQ) are significant at the 90% confidence level using the one-tail test. This further implies that the sign of the coefficient of D1SQ is negative. It also means that the price-radial distance curve is concave, similar to that of a Ridgeway shopping center complex case. That is, the values of nearby properties rise as the distance from the complex increases and then fall after that distance. This distance up to which the values of properties rise is 4,829 feet.[9] The price rise per foot at various radial distances from the shopping center complex is shown in Table 16 on page 78. From Table 16, it is clear that as the radial distance from complex increases, house prices rise but at a decreasing rate. For example, at 1,500 feet from the complex, the price rise per foot is $ 16.54. At 2,000 feet, the price rise per foot is $ 14.05. The price rise/foot at various distances from this complex is different from that of Ridgeway shopping center complex case. This difference is due to the different sizes of these complexes. The Millhopper shopping center complex has 294,191 square feet of total GLA (Gross Leasable Area), 104 stores, and 1,430 parking spaces. Ridgeway shopping center complex has 48,500 square feet of total GLA, 22 stores, and 150 parking spaces. The higher the size of a complex, the higher the positive and negative externalities associated with it and the higher the price rise/foot from the complex as we move away from it. In other words, there is a size effect on the house price rise/foot.

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[9] The price-radial distance can be written as $SP = Intercept + 23.989066*D1 - 0.002484*D1SQ + \mathscr{E}$ The second order differentiation of SP with respect to D1 would give a negative value. The negative value is a necessary and sufficient condition for concavity and maxima to exist. The maximum value is found by first order differentiation which is $dSP/dD1 = 23.989066 - 0.004968*D1$ and setting it to zero. Solving this gives D1 = 4829 feet. It is up to this radial distance from the complex that the price rises.

The other variables which are found to be significant at the 95% confidence level are road distance to a nearby park (D3) and square of the road distance from the nearby park (D3SQ). The price-distance function from the nearby park is found to be concave. It implies that households prefer not to live near parks. The road distance from the nearby elementary school, square of road distance from elementary school, road distance from point of intersection, and square of road distance from point of intersection are found to be insignificant in this case. The structural variables of a house which are found significant at the 95% level of confidence using the one-tail test are square of living area, lotsize, square of lotsize, number of stories, age, and finished screen porch. The signs of structural variables like living area, lotsize, number of stories, age, and finished screen porch correspond well with the expected signs. That is, the higher the quantity of each of these variables, the higher the selling price of a house. The sign of the coefficient of variable 'age' is found to be negative. That is, the higher the age, the lower the value of the house.[10] The semi-log model has lower R^2 and t values of individual variables. Similar to the results of previous complex, the log model is found unsuitable. The various models and their results are attached.

5.3 Analysis of Hancock Shopping Center

The tables of summary statistics, complete model, and the linear, semi-log, and log forms of the common model for Hancock shopping center are shown at the end of the chapter. The criteria for developing the common model and selecting the various variables are already mentioned on page 34. As mentioned earlier, this is a neighborhood shopping center and is the smallest among the three cases studied in this research.

For Hancock shopping center, adjusted R^2 values in the linear, semi-log, and log form are 0.5025, 0.5017, and 0.5276 respectively. This means that the linear, semi-log, and log form measure approximately 50%, 50%, and 53% respectively of the total variation in selling price that is explained by the simultaneous predictive power of all independent variables used in these forms. These high percentages show that the models in these forms fit the data quite well. F values in each of these forms are significant as probability > F is 0.0001. These values simply confirm the overall utility of these model forms.[11]

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[10] There is a concave relationship for living area implying that with the increase in living area up to a certain figure, the values of properties rise.

This neighborhood shopping center is located in a residential area where the mean selling price of the house is $51,540. The mean values of living area, lotsize, number of stories, age, bedrooms, bathrooms, and number of months sold are 1,191 square feet, 8,342 square feet, 1, 12 years, 3, 2, and 33 respectively. The standard deviations of these variables are 116 square feet, 1,687 square feet, 0.13, 5.08 years, 0.32, 0.34, and 13.77 respectively. The mean values of radial distance, road distance from the nearby park, road distance from nearby elementary school, and road distance from nearby point of intersection are 2,193, 2,666, 7,777, and 12,746 feet respectively. The standard deviations of these variables are 1,155, 839, 1,412, and 2,543 feet respectively.

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[11] F statistic determines whether the data provide sufficient evidence to indicate that the model contributes information for the prediction of dependent variable.

Among locational variables, the effect of radial distance from the neighborhood shopping center on house values is insignificant. The coefficient of radial distance is very small, and the square of radial distance is insignificant. This may be due to the smaller size of the center (47,500 square feet) compared to the other two complexes. Perhaps, the small center does not generate sufficient negative or positive externalities to affect significantly the values of surrounding properties. The road distance from nearby park, square of road distance from the park, road distance from the point of intersection, and square of road distance from the point of intersection are found insignificant in this case. The road distance from nearby elementary school and square of road distance from elementary school are significant at the 95% confidence level. There is evidence that households prefer to locate near an elementary school.

Within the 95% confidence level, the significant structural variables of a house are living area, square of living area, lotsize, square of lotsize, age, and finished screen porch. The signs of the structural variables like living area, lot-size, and finished open porch are again positive as expected. That is, the higher the value of each of these variables, the higher the selling price of a house. The sign of the coefficient of age variable is negative as expected. That is, the higher the age, the lower the selling price. The common model is slightly better than the semi-log model due to its overall better fit, higher R^2, and more significant t-values of individual variables. Due to difficulty in the interpretation of the individual variables, the log model is not considered further.[12] In the following pages are shown various models of shopping centers studied in this research.

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[12] The log model is not considered further in all cases as there is difficulty in interpretation of the individual variables.

Table 1. SUMMARY STATISTICS of RIDGEWAY SHOPPING CENTER COMPLEX

N Obs	Variable	Minimum	Maximum	Mean	Std Dev
106	SP	40000.00	87000.00	59204.10	10643.01
	LA	1008.00	2028.00	1340.15	217.60
	LASQ	1016064.00	4112784.00	1842932.86	628680.37
	LOTSZ	5035.00	24610.00	10494.97	3526.64
	LOTSZSQ	25351225.00	605652100.00	122477165.41	94109344.05
	SRES	1.00	3.00	1.17	0.56
	AGE	2.70	18.70	13.22	4.76
	AFSP	1.00	2.00	1.07	0.25
	BB	2.00	4.00	2.92	0.32
	BR	1.00	3.00	1.94	0.30
	NMS	8.40	56.40	26.67	11.66
	NMSSQ	70.56	3180.96	846.01	644.07
	D1	300.00	5900.00	3252.99	1148.66
	D1SQ	90000.00	34810000.00	11891492.54	7532420.88
	D3	1800.00	8700.00	5359.33	1728.27
	D3SQ	3240000.00	75690000.00	31687033.58	17616784.28
	D4	5550.00	15400.00	10142.16	2813.71
	D4SQ	30802500.00	237160000.00	110721361.94	56331272.85
	D8	16700.00	34600.00	24854.85	6209.29
	D8SQ	278890000.00	1197160000.0	656031212.69	306875530.95

These variables are:
SP = Selling price of a house
LA = Living Area
Lotsz = Lot-size
Sres = Number of stories
Age = Number of years from the date the house was built until the date

Table 1--extended

AFSP = Finished screen porch
NMS = Number of months sold from the date of last sale until the date of this study
D1 = Radial distance of a house from a shopping center
D3 = Road distance of the house from the nearby park
D4 = Road distance of the house from the nearby elementary school
distance of the house from the University (another major employment place besides CBD in Gainesville, Florida)
D8= Road distance from the nearest point on the intersection of 13th street and NW 16th avenue for going to various employment places in Gainesville.

Table 2. MODEL1-COMPLETE MODEL OF RIDGEWAY SHOPPING CENTER COMPLEX
Dependent Variable: SP

```
                        Analysis of Variance

                              Sum of         Mean
      Source          DF     Squares       Square      F Value       Prob>F

      Model           37 9610588968.2 259745647.79      13.971       0.0001
      Error           67 1245680936.5 18592252.784
      C Total        104  10856269905

          Root MSE    4311.87347     R-square        0.8853
          Dep Mean   60810.95238     Adj R-sq        0.8219

                        Parameter Estimates

                      Parameter      Standard    T for H0:
     Variable  DF      Estimate         Error   Parameter=0    Prob > |T|

     INTERCEP   B       -932775  465745.85153        -2.003        0.0493
     LA         B     79.929989   24.90748966         3.209        0.0020
     LOTSZ      B     -0.909008    0.81492778        -1.115        0.2686
     LASQ       B     -0.019949    0.00815820        -2.445        0.0171
     LOTSZSQ    B   0.000026267    0.00003001         0.875        0.3846
     EXTW1      1   -178.322218  199.15741011        -0.895        0.3738
     EXTW2      1    -26.397668  149.39277469        -0.177        0.8603
     AFCP       1   5341.521511  2434.5593706         2.194        0.0317
     AFEP       B        660364  358148.69818         1.844        0.0696
     AFGR       1   6845.536108  2004.0441727         3.416        0.0011
     AFOP       1    583.786965  1360.3189944         0.429        0.6692
     AFSP       1  -2806.227409  2631.0775133        -1.067        0.2900
     AHTGF      1   2982.022873  1834.5265171         1.626        0.1088
     AAIRC      0             0    0.00000000          .             .
```

Table 2--extended

AQLTY	0	0	0.00000000	.	.
BR	1	4347.936592	2470.6979454	1.760	0.0830
BB	1	4563.213414	3029.9007302	1.506	0.1368
SRES	1	18160	4811.0434492	3.775	0.0003
AGE	B	590.722406	866.29877000	0.682	0.4977
NMS	1	108.189891	218.98858785	0.494	0.6229
NMSSQ	1	-2.188863	4.12849118	-0.530	0.5977
D1	B	22.743812	10.23914502	2.221	0.0297
D2	B	-49.093522	24.94285450	-1.968	0.0532
D3	B	25.113785	12.93798538	1.941	0.0565
D4	B	-48.650809	22.69939693	-2.143	0.0357
D5	B	54.968913	31.50439231	1.745	0.0856
D6	B	30.855437	294.30555085	0.105	0.9168
D7	B	-11.852507	222.03292696	-0.053	0.9576
D8	0	0	0.00000000	.	.
D1SQ	1	-0.001073	0.00077589	-1.383	0.1711
D2SQ	B	0.000309	0.00034551	0.895	0.3740
D3SQ	B	-0.000164	0.00046193	-0.355	0.7237
D4SQ	B	0.000349	0.00031346	1.115	0.2690
D5SQ	B	0.000015682	0.00016073	0.098	0.9226
D6SQ	B	-0.000486	0.00458473	-0.106	0.9159
D7SQ	0	0	0.00000000	.	.
D8SQ	B	0.000262	0.00453796	0.058	0.9542
AFEPD1	B	-15.020266	8.00058516	-1.877	0.0648
AFEPD2	B	45.201306	24.74652846	1.827	0.0722
AFEPD3	B	-21.259310	12.33921103	-1.723	0.0895
AFEPD4	B	39.050418	22.28169878	1.753	0.0842
AFEPD5	B	-54.812062	30.61192517	-1.791	0.0779
AFEPD6	0	0	0.00000000	.	.
AFEPD7	0	0	0.00000000	.	.
AFEPD8	0	0	0.00000000	.	.

Table 3. MODEL2-LINEAR MODEL OF RIDGEWAY SHOPPING CENTER COMPLEX
Dependent Variable: SP

```
                         Analysis of Variance

                          Sum of          Mean
Source          DF       Squares        Square      F Value       Prob>F

Model           17 9231986935.1 543058055.01       26.791       0.0001
Error           88 1783775918.6 20270180.894
C Total        105  11015762854

    Root MSE    4502.24176     R-square        0.8381
    Dep Mean   60930.66038     Adj R-sq        0.8068

                         Parameter Estimates

                      Parameter      Standard    T for H0:
Variable  DF           Estimate         Error   Parameter=0    Prob > |T|

INTERCEP   1            -254928  74673.120522        -3.414        0.0010
LA         1          86.777204   22.09266147         3.928        0.0002
LASQ       1          -0.022475    0.00743811        -3.022        0.0033
LOTSZ      1          -0.422218    0.73462259        -0.575        0.5669
LOTSZSQ    1        0.000024191    0.00002711         0.892        0.3746
SRES       1              18539  4833.7825046         3.835        0.0002
AGE        1         106.615413  733.61139620         0.145        0.8848
AFSP       1           0.116819  1842.9843958         0.000        0.9999
NMS        1        -182.651246  200.56076807        -0.911        0.3649
NMSSQ      1           3.625534    3.72126518         0.974        0.3326
D1         1           5.430245    2.48681307         2.184        0.0317
D1SQ       1          -0.000555    0.00030772        -1.803        0.0749
D3         1           6.855074    3.36402203         2.038        0.0446
D3SQ       1          -0.000417    0.00029577        -1.409        0.1624
D4         1          -7.292325    3.96012863        -1.841        0.0689
D4SQ       1           0.000304    0.00017689         1.717        0.0895
```

Table 3--extended

D8	1	18.478613	5.58681013	3.308	0.0014
D8SQ	1	-0.000353	0.00011198	-3.154	0.0022

Note: See Appendix A for list of variables

Table 4. MODEL3-SEMI-LOG MODEL OF RIDGEWAY SHOPPING CENTER COMPLEX
Dependent Variable: LNSP

```
                          Analysis of Variance

                                Sum of         Mean
     Source            DF      Squares       Square      F Value       Prob>F

     Model             17      2.38018      0.14001       24.575       0.0001
     Error             88      0.50137      0.00570
     C Total          105      2.88154

        Root MSE         0.07548     R-square       0.8260
        Dep Mean        11.00379     Adj R-sq       0.7924

                          Parameter Estimates

                       Parameter      Standard    T for H0:
    Variable  DF        Estimate         Error   Parameter=0    Prob > |T|

    INTERCEP   1        5.850657    1.25190473         4.673        0.0001
    LA         1        0.001598    0.00037039         4.315        0.0001
    LASQ       1    -0.000000426    0.00000012        -3.418        0.0010
    LOTSZ      1    -0.000005872    0.00001232        -0.477        0.6347
    LOTSZSQ    1     3.32081E-10    0.00000000         0.731        0.4669
    SRES       1        0.260039    0.08103900         3.209        0.0019
    AGE        1    -0.000007165    0.01229909        -0.001        0.9995
    AFSP       1       -0.006941    0.03089788        -0.225        0.8228
    NMS        1       -0.003769    0.00336243        -1.121        0.2654
    NMSSQ      1     0.000075177    0.00006239         1.205        0.2314
    D1         1        0.000095    0.00004169         2.277        0.0252
    D1SQ       1    -1.002368E-8    0.00000001        -1.943        0.0552
    D3         1        0.000097    0.00005640         1.728        0.0874
    D3SQ       1    -5.665327E-9    0.00000000        -1.143        0.2563
    D4         1       -0.000118    0.00006639        -1.773        0.0797
    D4SQ       1    5.0975454E-9    0.00000000         1.719        0.0891
```

Table 4--extended

D8	1	0.000299	0.00009366	3.190	0.0020
D8SQ	1	-5.74001E-9	0.00000000	-3.057	0.0030

Note: See Appendix A for list of variables

```
Table 5. MODEL4-LOG MODEL OF RIDGEWAY SHOPPING CENTER COMPLEX
Dependent Variable: LNSP
                              Analysis of Variance

                                 Sum of          Mean
       Source          DF       Squares        Square       F Value        Prob>F

       Model           16       2.38407       0.14900        26.658        0.0001
       Error           89       0.49747       0.00559
       C Total        105       2.88154

           Root MSE        0.07476      R-square       0.8274
           Dep Mean       11.00379      Adj R-sq       0.7963

                              Parameter Estimates

                         Parameter        Standard    T for H0:
     Variable  DF         Estimate           Error   Parameter=0    Prob > |T|

     INTERCEP   1      -228.914336     99.24800832        -2.306        0.0234
     LNLA       1         8.729259      3.60323565         2.423        0.0174
     LNLASQQ    1        -0.568378      0.24896819        -2.283        0.0248
     LNLOTSZ    1        -1.507830      1.20163788        -1.255        0.2128
     LNLTSQQ    1         0.084441      0.06454843         1.308        0.1942
     LNSRES     1         0.351316      0.11675121         3.009        0.0034
     LNAGE      1        -0.042151      0.08248636        -0.511        0.6106
     LNAFSP     1         0.000173      0.04492384         0.004        0.9969
     LNNMS      B        -0.000137      0.01484658        -0.009        0.9927
     LNNMSSQ    0                0      0.00000000             .             .
     LND1       1         0.632781      0.35166877         1.799        0.0753
     LND1SQQ    1        -0.038891      0.02616731        -1.486        0.1407
     LND3       1         0.723266      1.48650678         0.487        0.6278
     LND3SQQ    1        -0.037443      0.08894115        -0.421        0.6748
     LND4       1        -5.250669      5.13210940        -1.023        0.3090
     LND4SQQ    1         0.280957      0.28047103         1.002        0.3192
```

Table 5--extended

LND8	1	45.817075	21.25990639	2.155	0.0339
LND8SQQ	1	-2.262149	1.05530139	-2.144	0.0348

Note: See Appendix A for list of variables

Table 6. SUMMARY STATISTICS OF MILLHOPPER SHOPPING CENTER COMPLEX

N Obs	Variable	Minimum	Maximum	Mean	Std Dev
126	SP	34500.00	235000.00	78196.85	38459.72
	LA	1032.00	3143.00	1691.43	493.18
	LASQ	1065024.00	9878449.00	3102230.45	1968417.86
	LOTSZ	4260.00	40250.00	13147.50	5862.31
	LOTSZSQ	18147600.00	1620062500.0	206976300.65	223381794.36
	SRES	1.00	3.00	1.29	0.70
	AGE	2.70	31.70	10.93	6.60
	BB	1.00	3.50	2.06	0.35
	BR	2.00	5.00	3.10	0.53
	AFSP	1.00	2.00	1.19	0.39
	NMS	8.40	104.40	30.18	12.98
	NMSSQ	70.56	10899.36	1078.20	1045.51
	D1	1500.00	6600.00	4113.27	1141.25
	D1SQ	2250000.00	43560000.00	18213410.49	9308464.20
	D3	3000.00	14200.00	10229.44	2172.76
	D3SQ	9000000.00	201640000.00	109333263.58	39845991.24
	D4	700.00	15000.00	10101.48	3142.49
	D4SQ	490000.00	225000000.00	111854220.99	55736071.59
	D8	9500.00	25300.00	20046.42	3738.21
	D8SQ	90250000.00	640090000.00	415746927.16	140839305.11

Table 7. MODEL1-COMPLETE MODEL OF MILLHOPPER SHOPPING CENTER COMPLEX
Dependent Variable: SP

```
                         Analysis of Variance

                              Sum of         Mean
     Source          DF      Squares       Square      F Value       Prob>F

     Model           39 138573901630 3553176964.9        8.393       0.0001
     Error           79  33445372320 423359143.29
     C Total        118 172019273950

         Root MSE    20575.69302     R-square         0.8056
         Dep Mean    87655.46218     Adj R-sq         0.7096

                         Parameter Estimates

                       Parameter        Standard    T for H0:
   Variable  DF         Estimate           Error   Parameter=0    Prob > |T|

   INTERCEP   B           271240  839172.08793           0.323        0.7474
   LA         1       -19.122974   52.80484097          -0.362        0.7182
   LOTSZ      1         6.909702    2.10012396           3.290        0.0015
   LASQ       1         0.013091    0.01217512           1.075        0.2856
   LOTSZSQ    1        -0.000175    0.00004354          -4.025        0.0001
   EXTW1      1      -657.103233  578.36727558          -1.136        0.2593
   EXTW2      1      -598.891109  516.42665993          -1.160        0.2497
   AFCP       1            13034  14482.148665           0.900        0.3708
   AFEP       B          -319365  691000.15976          -0.462        0.6452
   AFGR       1            12717  9824.0961588           1.294        0.1993
   AFOP       1      5844.544422  6040.4071988           0.968        0.3362
   AFSP       1            13659  6169.7889293           2.214        0.0297
   AHTGF      1     -2455.436585  6816.3180967          -0.360        0.7196
   AAIRC      0                0    0.00000000               .             .
   AQLTY      1           -62681  21586.197779          -2.904        0.0048
```

Table 7--extended

BR	1	25777	13283.214463	1.941	0.0559
BB	1	42.869425	9035.1001078	0.005	0.9962
SRES	1	-6753.946365	18107.348531	-0.373	0.7102
AGE	1	-424.442975	616.06557354	-0.689	0.4929
NMS	1	-695.409125	848.40006091	-0.820	0.4149
NMSSQ	1	9.188754	14.30859614	0.642	0.5226
D1	B	-29.350577	87.81688663	-0.334	0.7391
D2	B	12.547198	44.84930185	0.280	0.7804
D3	B	-137.300278	108.13510568	-1.270	0.2079
D4	B	-25.590636	24.48325601	-1.045	0.2991
D5	B	-32.130746	26.15020131	-1.229	0.2228
D6	B	-21.528720	98.22651762	-0.219	0.8271
D7	B	79.444322	83.25929179	0.954	0.3429
D8	0	0	0.00000000	.	.

Table 7--extended

D1SQ	B	-0.000864	0.00274875	-0.314	0.7541
D2SQ	B	0.000777	0.00071727	1.084	0.2818
D3SQ	1	-0.000209	0.00108605	-0.192	0.8480
D4SQ	B	0.000011919	0.00055882	0.021	0.9830
D5SQ	B	-0.000265	0.00020228	-1.308	0.1948
D6SQ	B	0.001979	0.00201567	0.982	0.3293
D7SQ	B	-0.001725	0.00175015	-0.985	0.3274
D8SQ	0	0	0.00000000	.	.
AFEPD1	B	41.928359	83.97729012	0.499	0.6190
AFEPD2	B	-24.620479	43.74504563	-0.563	0.5752
AFEPD3	B	146.896045	109.22965182	1.345	0.1825
AFEPD4	B	20.015254	21.10551136	0.948	0.3458
AFEPD5	B	37.238038	26.06032596	1.429	0.1570
AFEPD6	B	-62.523153	40.62750413	-1.539	0.1278
AFEPD7	0	0	0.00000000	.	.
AFEPD8	0	0	0.00000000	.	.

Table 8. MODEL2-LINEAR MODEL OF MILLHOPPER SHOPPING CENTER COMPLEX
Dependent Variable: SP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	17	132274581870	7780857757.0	16.026	0.0001
Error	108	52435310194	485512131.43		
C Total	125	184709892063			

Root MSE	22034.33982	R-square	0.7161
Dep Mean	87436.50794	Adj R-sq	0.6714

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-120285	99521.363358	-1.209	0.2294
LA	1	37.273134	37.15837963	1.003	0.3181
LASQ	1	-0.001551	0.00902609	-0.172	0.8639
LOTSZ	1	7.635890	1.81227032	4.213	0.0001
LOTSZSQ	1	-0.000165	0.00003989	-4.133	0.0001
SRES	1	26635	9781.2874279	2.723	0.0075
AGE	1	-776.460124	398.09973411	-1.950	0.0537
AFSP	1	18813	5610.2758027	3.353	0.0011
NMS	1	-925.822421	779.51734047	-1.188	0.2376
NMSSQ	1	17.404530	12.92035790	1.347	0.1808
D1	1	23.989066	13.64598052	1.758	0.0816
D1SQ	1	-0.002484	0.00170473	-1.457	0.1480
D3	1	28.503180	14.72486512	1.936	0.0555
D3SQ	1	-0.001365	0.00076492	-1.785	0.0771
D4	1	4.981647	4.75159939	1.048	0.2968
D4SQ	1	-0.000305	0.00029046	-1.051	0.2955
D8	1	-15.060671	13.69793326	-1.099	0.2740
D8SQ	1	0.000329	0.00035343	0.930	0.3544

Note: See Appendix A for list of variables

Table 9. MODEL3-SEMI-LOG MODEL OF MILLHOPPER SHOPPING CENTER COMPLEX
Dependent Variable: LNSP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	17	11.18643	0.65802	15.585	0.0001
Error	108	4.56467	0.04222		
C Total	125	15.75110			

Root MSE	0.20549	R-square	0.7102
Dep Mean	11.30743	Adj R-sq	0.6649

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	9.114658	0.83469753	10.920	0.0001
LA	1	0.001011	0.00031165	3.243	0.0016
LASQ	1	-0.000000173	0.00000008	-2.289	0.0240
LOTSZ	1	0.000073609	0.00001520	4.843	0.0001
LOTSZSQ	1	-1.598353E-9	0.00000000	-4.778	0.0001
SRES	1	0.247991	0.08203682	3.023	0.0031
AGE	1	-0.007384	0.00333891	-2.212	0.0291
AFSP	1	0.186112	0.04705405	3.955	0.0001
NMS	1	-0.009372	0.00653790	-1.434	0.1546
NMSSQ	1	0.000170	0.00010836	1.566	0.1202
D1	1	0.000134	0.00011445	1.167	0.2457
D1SQ	1	-1.302857E-8	0.00000001	-0.911	0.3642
D3	1	0.000236	0.00012350	1.909	0.0589
D3SQ	1	-1.090204E-8	0.00000001	-1.699	0.0921
D4	1	0.000027372	0.00003985	0.687	0.4937
D4SQ	1	-2.115867E-9	0.00000000	-0.869	0.3870
D8	1	-0.000150	0.00011489	-1.307	0.1941
D8SQ	1	3.5870297E-9	0.00000000	1.210	0.2289

Note: See Appendix A for list of variables

Table 10. MODEL4-LOG MODEL OF MILLHOPPER SHOPPING CENTER COMPLEX
Dependent Variable: LNSP

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	16	11.35558	0.70972	17.600	0.0001
Error	109	4.39552	0.04033		
C Total	125	15.75110			

Root MSE	0.20081	R-square	0.7209
Dep Mean	11.30743	Adj R-sq	0.6800

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-68.506584	63.14077029	-1.085	0.2803
LNLA	1	6.212850	4.37296719	1.421	0.1582
LNLASQQ	1	-0.363813	0.29174357	-1.247	0.2151
LNLOTSZ	1	5.065262	2.31308495	2.190	0.0307
LNLTSQQ	1	-0.255835	0.12053356	-2.123	0.0361
LNSRES	1	0.494791	0.12721663	3.889	0.0002
LNAGE	1	-0.081140	0.03591333	-2.259	0.0259
LNAFSP	1	0.286456	0.07165025	3.998	0.0001
LNNMS	B	0.005983	0.03695880	0.162	0.8717
LNNMSSQ	0	0	0.00000000	.	.
LND1	1	1.152271	2.90566055	0.397	0.6925
LND1SQQ	1	-0.070419	0.18142015	-0.388	0.6987
LND3	1	-1.484203	4.62626208	-0.321	0.7490
LND3SQQ	1	0.098004	0.25988151	0.377	0.7068
LND4	1	2.336152	1.44935252	1.612	0.1099
LND4SQQ	1	-0.141848	0.09071818	-1.564	0.1208
LND8	1	4.184286	13.92285778	0.301	0.7643
LND8SQQ	1	-0.217986	0.71122336	-0.306	0.7598

Note: See Appendix A for list of variables

Table 11. SUMMARY STATISTICS OF HANCOCK SHOPPING CENTER

N Obs	Variable	Minimum	Maximum	Mean	Std Dev
84	SP	28000.00	67500.00	51540.29	7865.54
	LA	1002.00	1635.00	1191.09	116.46
	LASQ	1004004.00	2673225.00	1432124.82	286609.20
	LOTSZ	4050.00	14600.00	8342.02	1687.01
	LOTSZSQ	16402500.00	213160000.00	72410298.70	30258541.74
	SRES	1.00	3.00	1.03	0.26
	AGE	2.70	29.70	11.71	5.08
	BR	1.00	2.00	1.02	0.13
	BB	2.00	4.00	2.91	0.33
	AFSP	1.00	3.00	1.94	0.35
	NMS	12.00	56.40	32.70	13.77
	NMSSQ	144.00	3180.96	1257.56	931.06
	D1	200.00	4500.00	2193.63	1155.09
	D1SQ	40000.00	20250000.00	6133157.84	4869200.27
	D3	1100.00	5600.00	2666.67	839.33
	D3SQ	1210000.00	31360000.00	7808682.35	4791500.06
	D4	3700.00	9500.00	7777.75	1412.02
	D4SQ	13690000.00	90250000.00	62467573.53	19558653.90
	D8	7200.00	15500.00	12746.37	2543.04
	D8SQ	51840000.00	240250000.00	168873651.96	57565009.10

Table 12. MODEL1-COMPLETE MODEL OF HANCOCK SHOPPING CENTER
Dependent Variable: SP

```
                              Analysis of Variance

                                Sum of          Mean
      Source           DF      Squares        Square       F Value       Prob>F

      Model            36 2286895421.7 63524872.826          2.883       0.0022
      Error            29 639020131.28 22035176.941
      C Total          65 2925915553.0

          Root MSE      4694.16414     R-square         0.7816
          Dep Mean     53792.87879     Adj R-sq         0.5105

                              Parameter Estimates

                         Parameter        Standard    T for H0:
     Variable  DF         Estimate           Error   Parameter=0    Prob > |T|

     INCERCEP   B          7210725   1809873.3405          3.984        0.0004
     LA         B      -674.065181   196.93065316         -3.423        0.0019
     LOTSZ      B        14.842863     3.74870893          3.959        0.0004
     LASQ       B         0.276566     0.08191384          3.376        0.0021
     LOTSZSQ    B        -0.000860     0.00022651         -3.798        0.0007
     EXTW1      B       150.398324   201.42611872          0.747        0.4613
     EXTW2      B       296.008570   275.57813333          1.074        0.2916
     AFCP       B      4639.424312   8462.3804747          0.548        0.5877
     AFEP       B           -10812   63736.674867         -0.170        0.8665
     AFGR       1     -5649.373968   3450.5035514         -1.637        0.1124
     AFOP       B      -227.123537   2037.7189234         -0.111        0.9120
     AFSP       0                0     0.00000000           .             .
     AHTGF      1      -942.780975   1993.2466927         -0.473        0.6398
     AAIRC      0                0     0.00000000           .             .
```

Table 12--extended

AQLTY	B	-16914	40509.633439	-0.418	0.6794
BR	1	2134.493654	4322.1416549	0.494	0.6251
BB	B	-1066.238737	4163.8786425	-0.256	0.7997
SRES	B	-24938	7785.2440065	-3.203	0.0033
AGE	B	-862.252856	373.27110783	-2.310	0.0282
NMS	1	265.106175	335.33084597	0.791	0.4356
NMSSQ	B	-2.316183	5.12692917	-0.452	0.6548
D1	B	9.020468	60.68406754	0.149	0.8829
D2	B	-32.679377	40.79326911	-0.801	0.4296
D3	B	15.113800	15.14809276	0.998	0.3267
D4	B	53.568128	19.90311296	2.691	0.0117
D5	B	-2.316025	112.43778246	-0.021	0.9837
D6	B	1952.417524	716.72647771	2.724	0.0108
D7	B	-2308.402263	735.38735616	-3.139	0.0039
D8	0	0	0.00000000	.	.

Table 12--extended

D1SQ	B	0.001810	0.00236081	0.767	0.4495
D2SQ	B	0.002256	0.00137827	1.637	0.1125
D3SQ	B	-0.003773	0.00161597	-2.335	0.0267
D4SQ	B	-0.002960	0.00159566	-1.855	0.0738
D5SQ	B	-0.000032315	0.00429155	-0.008	0.9940
D6SQ	B	-0.043244	0.01606503	-2.692	0.0117
D7SQ	B	0.045985	0.01476986	3.113	0.0041
D8SQ	0	0	0.00000000	.	.
AFEPD1	B	-11.138858	56.79956269	-0.196	0.8459
AFEPD2	B	8.888496	42.91898137	0.207	0.8374
AFEPD3	B	12.892630	12.15569417	1.061	0.2976
AFEPD4	B	-2.853844	7.38067688	-0.387	0.7018
AFEPD5	0	0	0.00000000	.	.
AFEPD6	0	0	0.00000000	.	.
AFEPD7	0	0	0.00000000	.	.
AFEPD8	0	0	0.00000000	.	.

Table 13. MODEL2-LINEAR MODEL OF HANCOCK SHOPPING CENTER
Dependent Variable: SP

```
                         Analysis of Variance

                         Sum of         Mean
Source           DF     Squares        Square      F Value      Prob>F

Model            17 3224366715.7 189668630.34        5.932      0.0001
Error            66 2110333583.1 31974751.259
C Total          83 5334700298.8

     Root MSE    5654.62211     R-square       0.6044
     Dep Mean   51950.11905     Adj R-sq       0.5025

                        Parameter Estimates

                  Parameter      Standard    T for H0:
Variable  DF       Estimate         Error   Parameter=0    Prob > |T|

INTERCEP   1         230020  94690.496784         2.429        0.0179
LA         1    -269.125356  145.42891097        -1.851        0.0687
LASQ       1       0.109605    0.06116647         1.792        0.0777
LOTSZ      1       9.202405    3.50099919         2.629        0.0107
LOTSZSQ    1      -0.000589    0.00020832        -2.827        0.0062
SRES       1         -10255  5568.9481502        -1.841        0.0700
AGE        1    -439.785937  205.96289934        -2.135        0.0365
AFSP       1         -14577  6181.8601710        -2.358        0.0213
NMS        1     -38.773694  307.18738456        -0.126        0.8999
NMSSQ      1       0.751268    4.53590574         0.166        0.8690
D1         1      -3.456143    3.80291390        -0.909        0.3668
D1SQ       1       0.001117    0.00089296         1.251        0.2154
D3         1      -3.494571    6.16678415        -0.567        0.5729
D3SQ       1       0.000620    0.00086693         0.715        0.4771
D4         1     -22.159294    7.96601161        -2.782        0.0070
D4SQ       1       0.001599    0.00061755         2.590        0.0118
```

Table 13--extended

D8	1	9.174089	8.64248976	1.062	0.2923
D8SQ	1	-0.000347	0.00040028	-0.867	0.3888

Note: See Appendix A for list of variables

Table 14. MODEL3-SEMI-LOG MODEL OF HANCOCK SHOPPING CENTER
Dependent Variable: LNSP

```
                         Analysis of Variance

                               Sum of         Mean
      Source          DF      Squares       Square      F Value       Prob>F

      Model           17      1.44419      0.08495        5.915       0.0001
      Error           66      0.94787      0.01436
      C Total         83      2.39206

         Root MSE       0.11984     R-square       0.6037
         Dep Mean      10.84475     Adj R-sq       0.5017

                         Parameter Estimates

                      Parameter       Standard     T for H0:
    Variable  DF       Estimate          Error   Parameter=0    Prob > |T|

    INTERCEP   1      13.954468     2.00681030         6.954        0.0001
    LA         1      -0.004780     0.00308213        -1.551        0.1257
    LASQ       1    0.000001940     0.00000130         1.497        0.1393
    LOTSZ      1       0.000172     0.00007420         2.324        0.0232
    LOTSZSQ    1   -1.124164E-8     0.00000000        -2.546        0.0132
    SRES       1      -0.189505     0.11802475        -1.606        0.1131
    AGE        1      -0.007429     0.00436505        -1.702        0.0935
    AFSP       1      -0.312702     0.13101442        -2.387        0.0199
    NMS        1      -0.001087     0.00651033        -0.167        0.8679
    NMSSQ      1    0.000018535     0.00009613         0.193        0.8477
    D1         1   -0.000090510     0.00008060        -1.123        0.2655
    D1SQ       1   2.6868359E-8     0.00000002         1.420        0.1604
    D3         1   -0.000081089     0.00013069        -0.620        0.5371
    D3SQ       1   1.4789798E-8     0.00000002         0.805        0.4237
    D4         1      -0.000491     0.00016883        -2.909        0.0049
    D4SQ       1   3.6496907E-8     0.00000001         2.789        0.0069
```

Table 14--extended

D8	1	0.000236	0.00018316	1.290	0.2014
D8SQ	1	-9.334805E-9	0.00000001	-1.100	0.2752

Note: See Appendix A for list of variables

Table 15. MODEL4-LOG MODEL OF HANCOCK SHOPPING CENTER
Dependent Variable: LNSP

```
                          Analysis of Variance

                              Sum of          Mean
     Source           DF     Squares        Square      F Value       Prob>F

     Model            16     1.47996       0.09250        6.794       0.0001
     Error            67     0.91211       0.01361
     C Total          83     2.39206

         Root MSE       0.11668      R-square         0.6187
         Dep Mean      10.84475      Adj R-sq         0.5276

                          Parameter Estimates

                      Parameter       Standard     T for H0:
   Variable  DF        Estimate          Error   Parameter=0    Prob > |T|

   INTERCEP   1      155.278966   106.87374450         1.453        0.1509
   LNLA       1      -27.293024    24.86484606        -1.098        0.2763
   LNLASQQ    1        1.922109     1.75945721         1.092        0.2786
   LNLOTSZ    1       14.057262     4.09625621         3.432        0.0010
   LNLTSQQ    1       -0.792175     0.22897230        -3.460        0.0009
   LNSRES     1       -0.235435     0.16687163        -1.411        0.1629
   LNAGE      1       -0.047697     0.03573449        -1.335        0.1865
   LNAFSP     1       -0.400426     0.18318741        -2.186        0.0323
   LNNMS      B        0.005185     0.03111631         0.167        0.8682
   LNNMSSQ    0               0     0.00000000           .            .
   LND1       1        0.054011     0.46236250         0.117        0.9074
   LND1SQQ    1       -0.000341     0.00839823        -0.041        0.9678
   LND3       1       -3.154324     1.90858071        -1.653        0.1031
   LND3SQQ    1        0.049809     0.03024765         1.647        0.1043
   LND4       1      -16.278468     6.61119218        -2.462        0.0164
   LND4SQQ    1        0.227899     0.09522397         2.393        0.0195
```

Table 15--extended

LND8	1	-5.874766	18.03187967	-0.326	0.7456
LND8SQQ	1	0.085302	0.24412823	0.349	0.7279

Note: See Appendix A for list of variables

Table 16. PRICE RISE PER FOOT FROM THE COMPLEXES

	Ridgeway Shopping Center Complex	Millhopper Shopping Center Complex
Radial Distance D1 In Feet	Price Rise/Foot At That Distance In $	Price Rise/Foot At That Distance In $
500	4.87524	21.50507
1000	4.32024	19.02107
1500	3.76524	16.53707
2000	3.21024	14.05307
2500	2.65524	11.56907
3000	2.10024	9.08506
3500	1.54524	6.60106
4000	0.99024	4.11706
4500	0.43524	1.63306
5000	-0.11975	-0.85093
5500	-0.67476	-3.33493
6000	-1.22976	-5.81893

Note: The price rise for Ridgeway Shopping Center Complex is found using price gradient which is dSP/dD1 = 5.430245 -0.001110 * D1. At 1,500 feet, as we move one foot away from the complex, dD1 = 1 foot. Substituting D1= 1,500 feet in the equation, we get dSP = $ 3.765. Similarly, price rise/foot at various distances from the Millhopper Shopping Center Complex is found.

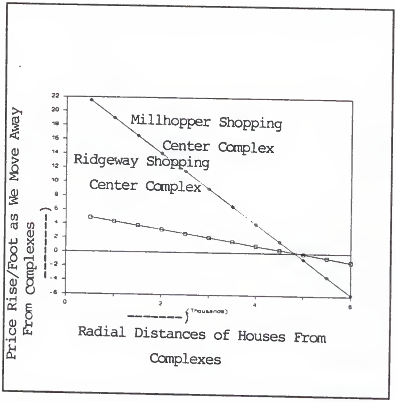

Figure 4. PRICE RISE/FOOT

Table 17. RACE IN PERCENTAGES

YEAR	ZIP CODE	WHITE	BLACK
1987	32605	92.1	4.7
	32606	93.9	3.3
1992	32605	91.3	5.2
	32606	93.2	3.7

* Source: The Sourcebook Of Demographics & Buying Power For Every Zip Code In The USA, Arlington, VA: C.A.C.I, 1987.

CHAPTER 6
CONCLUSIONS

This empirical study about the effect of shopping center(s) on the values of surrounding properties provides evidence for the following:

(1) The values of residential properties do not change significantly as the radial distance from neighborhood shopping centers increases. However, the values of properties do change significantly as the radial distance from shopping center complexes increases. The price-distance curve in both cases of shopping center complexes is concave. That is, the house prices are lower near the complex, then rise as the distance from the complex increases, and fall after a certain distance. As the size of the complex increases, the sizes of coefficients of radial distance and square of radial distance from the complex increase. The slope of the price-distance curve for the larger complex is steeper than for the smaller complex. The price rise/foot at a certain distance from a shopping center complex depends upon the size of the complex.

The results regarding the neighborhood shopping center in this study are inconsistent with the results of the previous study by Colwell et al.(1985). In that study, the values of properties rose with distance from the shopping center after the announcement of its construction. However, for the complexes, the results are consistent with the previous study by Colwell et al., as in both these cases, there is a positive gradient. The results of shopping center complexes are also inconsistent with the findings of Grether and Mieszkowski (1980), as the radial distance of properties from the complexes and square of radial distance affect their values.

The results of shopping center complexes in this study are consistent with the study done by Kain and Quigley (1970a) who found that proximity to a commercial property had a negative impact on apartment rents and on the values of single-family homes. This study also supports the views of Grether and Mieszkowski (1980), who contend that effects of an externality may be quite localized. In this study, too, prices rise only up to a certain distance from the complexes.

This study also supports the notion provided by Richardson (1977a) about the possibility of a positive rent gradient in the housing market due to the presence of externalities. It also lends support to the results of the Colwell and Foley (1979) study that negative effects are generated by an externality on the values of surrounding properties.

(2) Households do not seem to have much preference for living near a park. This result is found in the two cases studied (namely, Ridgeway shopping center complex & Millhopper shopping center complex). In the third case, no conclusion can be made, as distance from nearby park is found to affect insignificantly the house values. In the Ridgeway and Millhopper cases, house prices rise as the distance from the nearby park increases. As mentioned earlier, this may be due to the noise generated in and around the park, and fear of crime. This result is inconsistent with the result of a previous study by Kitchen and Hendon (1967); they found that positive impacts are generated by nearby parks. In later studies, Hendon (1971, 1973 & 1974) concluded that parks exhibit either a positive or negative effect upon the values of surrounding properties. However, the result of this study is consistent with the results of Walters (1975), and Mieszkowski and Saper (1978) that houses in noisy locations sell at a discount from those not located in such locations.

(3) The road distance from a nearby elementary school is highly negatively significant in two of the three cases studied (namely, Hancock shopping center and Ridgeway shopping center complex), where neighborhood shopping centers are surrounded by residential areas. This implies that households prefer being near an elementary school.

(4) The structural variables of a house which are found significant are its living area, lotsize, age, and number of stories. The results of this study are consistent with the results of a study done by Johnson and Phillips (1984) about the effect of living space on the capital gains (value increases). The structural variable 'finished screen porch' is found significant in two cases (namely, Hancock shopping center and Millhopper shopping center complex). This seems to affect the house prices depending upon the household's preferences in that area and the distribution of this variable in the various subdivisions.

(5) The living area and lotsize have a convex shape at their lower values and a concave shape at their higher values. Further research is needed in this area.

(6) The variables air-conditioning rating, type of heating fuel used, quality of construction, and number of months sold are found insignificant in all three cases studied. This result is inconsistent with the findings of Johnson and Phillips (1984) about the effect of quality on the values of surrounding properties. In this study, quality is highly correlated with other structural variables, and the sign of the coefficient is opposite to that expected. Since quality can be represented as some linear combination of other structural variables, this variable is not included in the final model.

(7) A common model is found for all the shopping centers under study. This model includes the variables of a house: living area, square of living area, lot-size, square of lot-size, number of stories, age of the house, finished screen porch, number of months since sale, square of number of months since sale, radial distance of the house from shopping center or complex, square of radial distance of the house from shopping center or complex, road distance from a nearby park, square of the road distance from the nearby park, road distance from a nearby elementary school, square of road distance from the nearby elementary school, road distance from the point of intersection of NW 13th street and NW 16th avenue through which many households travel to go to various places of employment, and the square of this road distance.

(8) The house price gradient for the larger shopping center complex is (23.989066 - 0.0049680 * D1) and for the smaller shopping center complex is (5.430245 - 0.00111 * D1), keeping all other variables constant. The slope of the house price gradient of the larger shopping center complex is 'steeper' as compared to that of a smaller shopping center complex. The values of properties increase much more as the distance increases from the larger shopping center complex than from the smaller shopping center

complex. This result is consistent with the notion of Richardson about the possibility of a positive rent gradient due to the presence of externalities.

(9) The quadratic terms of some structural and locational variables significantly affect the values of surrounding properties.[1]

Thus, in short, this study provides empirical evidence that radial distance from a shopping center complex is significant for the values of surrounding residential properties. However, radial distance from a neighborhood shopping center is insignificant for the values of properties. The price-distance curves for both complexes are found to be concave. Lastly, this study provides a common model that specifies the significant variables which affect house values and is used to compare the effects of different shopping centers on the values of the surrounding properties.

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[1] The third-order terms of various variables were tested and found to affect insignificantly the house prices.

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APPENDIX
LIST OF VARIABLES

SP = Selling price of a house
LA = Its Living Area
LOTSZ = Lot-size
SRES = Number of stories
AGE = Number of years from the date it was built till the date of study
BB = Number of bed-rooms
BR = Number of bath-rooms
AFGR = Finished garage
AFCP = Finished carport
AFEP = Finished enclosed porch
AFSP = Finished screen porch
AFOP = Finished open porch
QLTY = Quality of construction
NMS = Number of months sold from the date of last sale till the date of study
NMSSQ= Square of NMS
EXTW1 = Exterior wall1
EXTW2 = Exterior wall2
LASQ = Square of living area
LOTSZSQ = Square of lot-size
D1 = Radial distance of a house from a shopping center
D2 =Road distance of the house from the shopping center
D3 = Road distance of the house from the nearby park
D4 = Road distance of the house from the nearby elementary school
D5 = Road distance of the house from the nearby high school
D6 = Road distance of the house from the University (another major employment place besides CBD in Gainesville, Florida)
D7 = Road distance of the house from CBD
D8 = Road distance of the house from the intersection of major roads (13th Street and NW 16th Avenue) for going to various scattered places of employment in Gainesville

places of employment in Gainesville
D1SQ = Square of radial distance
from shopping center
D2SQ = Square of road distance
from shopping center
D3SQ = Square of road distance
from nearby park
D4SQ = Square of road distance
from nearby elementary school
D5SQ = Square of road distance
from nearby high school
D6SQ = Square of road distance
from University
D7SQ = Square of road distance
from Central Business District (CBD)
D8SQ= Square of road distance
of the house from the intersection
of major roads
LnSP= Log of selling price of
the house
LnLA= Log of living area
LnLOTSZ= Log of lot-size
LnLTSQQ = Square of Log(lotsz)
LnSRES= Log of SRES
LnAGE= Log of AGE
LnAFSP = Log of AFSP
LnD1= Log of D1
LnD2= Log of D2
LnD3= Log of D3
LnD4= Log of D4
LnD5= Log of D5
LnD6= Log of D6
LnD7= Log of D7
LnD8= Log of D8
LnD1SQQ= Square of LogD1
LnD2SQQ= Square of LogD2
LnD3SQQ= Square of LogD3
LnD4SQQ= Square of LogD4
LnD5SQQ= Square of LogD5
LnD6SQQ= Square of LogD6
LnD7SQQ= Square of LogD7
LnD8SQQ= Square of LogD8.

Note:AFEP=2 if finished enclosed porch is there, otherwise 1
AFGR=2 if finished garage is there, otherwise 1
AFCP=2 if finished carport is there, otherwise 1
AFSP=2 if finished screen porch is there, otherwise 1
AFOP=2 if finished open porch is there, otherwise 1

BIOGRAPHICAL SKETCH

Rajeshwar Sirpal was born in Panjab (India). He got his undergraduate degree in production engineering from the Panjab University in 1971. Then, he earned his M.B.A. degree from the University of Delhi in 1973. He taught for six years in Kenya before he was admitted to the Ph.D. program at the University of Florida.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Halbert C. Smith

Halbert C. Smith, Chairman
Professor of Finance,
Insurance, and Real
Estate

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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May, 1992

Dean, Graduate School